

Amendments to the Claims:

The listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently Amended) A heat transfer system which comprises:
  - a supply tube having a proximal end and a distal end;
  - a capillary tube having a proximal end and a distal end, with said proximal end thereof connected in fluid communication with said distal end of said supply tube;
  - a tip member positioned to surround said distal end of said capillary tube forming a cryo-chamber therebetween;
  - a source of refrigerant fluid, connected in fluid communication with said proximal end of said supply tube;
  - a means for introducing the refrigerant fluid into said supply tube at a working pressure " $p_w$ ", for transfer of the refrigerant fluid through said supply tube and through said capillary tube to exit from said distal end of said capillary tube and into said cryo-chamber in a substantially liquid state, for transition of the refrigerant fluid into a gaseous state with a tip pressure " $p_t$ " and a tip temperature " $T_t$ ", for heat transfer through said tip member and into the gaseous fluid refrigerant in said cryo-chamber;

a temperature sensor for measuring the tip temperature " $T_t$ "; and

a means connected to said temperature sensor and to said introducing means for controlling said working pressure " $p_w$ " according to the tip temperature " $T_t$ " to minimize both the tip temperature [ $T_t$ ] " $T_t$ " and the working pressure " $p_w$ " required to minimize the tip temperature " $T_t$ ".

2. (Original) A system as recited in claim 1 wherein said refrigerant fluid is nitrous oxide ( $\text{N}_2\text{O}$ ).

3. (Original) A system as recited in claim 1 wherein said working pressure " $p_w$ " is in a range between three hundred and fifty psia and five hundred psia.

4. (Original) A system as recited in claim 1 wherein a pressure regulator is in fluid communication with said source of said fluid refrigerant and said controlling means.

5. (Original) A system as recited in claim 1 wherein said temperature sensor is mounted on an interior surface of said tip member.

6. (Original) A system as recited in claim 1 wherein said temperature sensor is mounted on said distal end of said capillary tube.

7. (Original) A system as recited in claim 1 wherein said tip pressure " $p_t$ " is less than one atmosphere.

8. (Original) A system as recited in claim 1 wherein the tip temperature, " $T_t$ ", is less than minus eighty-four degrees Centigrade ( $T_t < -84^\circ\text{C}$ ).

9. (Original) A system as recited in claim 1 wherein said controlling means is a system controller which comprises: a signal receiver, a processor, and a pressure control algorithm.

10. (Currently Amended) A heat transfer system which comprises:

a means for providing a liquid refrigerant at a first pressure;

a means for reducing the pressure on said liquid refrigerant from said first pressure to a second pressure;

a means for introducing said liquid refrigerant into a cryo-chamber at said second pressure for transition of said liquid refrigerant into a gaseous state in said cryo-chamber to cause heat to transfer from outside said cryo-chamber, into said cryo-chamber;

a means for sensing a temperature in said cryo-chamber; and

a means connected to said sensing means and to said introducing means for controlling said first pressure according to the temperature in said cryo-chamber to minimize both the temperature in said cryo-chamber and the first pressure required to minimize the temperature.

11. (Original) A system as recited in claim 10 wherein said liquid refrigerant is nitrous oxide (N<sub>2</sub>O).

12. (Original) A system as recited in claim 10 wherein said reducing means comprises:

a supply tube having a proximal end and a distal end; and

a capillary tube having a proximal end and a distal end, with the proximal end thereof connected in fluid communication with the distal end of said supply tube.

13. (Original) A system as recited in claim 10 wherein said sensing means is a temperature sensor mounted in said cryo-chamber.

14. (Original) A system as recited in claim 12 wherein said sensing means is a temperature sensor mounted on said distal end of said capillary tube.

15. (Original) A system as recited in claim 10 wherein said means for controlling said first pressure comprises: a system controller, a processor, a pressure control algorithm, and a pressure regulator.

16. (Currently Amended) A method for transferring heat which comprises the steps of:

providing a liquid refrigerant at a first pressure;

reducing the pressure on said liquid refrigerant from said first pressure to a second pressure;

introducing said liquid refrigerant into a cryo-chamber at said second pressure for transition of said liquid refrigerant into a gaseous state in said cryo-chamber to cause a transfer of heat from outside said cryo-chamber, through a tip, and into said cryo-chamber;

sensing a tip temperature " $T_t$ ";

electronically communicating said tip temperature " $T_t$ " to a system controller; and

controlling said first pressure according to said tip temperature " $T_t$ " to minimize said tip temperature " $T_t$ " and the first pressure required to minimize said tip temperature " $T_t$ " by selectively increasing said first pressure until substantially no change in said tip temperature " $T_t$ " results from increasing said first pressure, and by selectively decreasing said first pressure until a predetermined increase in said tip temperature " $T_t$ " results from decreasing said first pressure.

17. (Original) A method as recited in claim 16 wherein said liquid refrigerant is nitrous oxide ( $\text{N}_2\text{O}$ ).

18. (Original) A method as recited in claim 16 wherein said first pressure is a working pressure " $p_w$ " in a range between three hundred and fifty psia and five hundred psia, and said second pressure is a tip pressure " $p_t$ " of less than one atmosphere.

19. (Original) A method as recited in claim 16 wherein the tip temperature " $T_t$ " is less than minus eighty-four degrees Centigrade ( $T_t < -84^\circ\text{C}$ ).

20. (Original) A method as recited in claim 16 wherein said controlling the first pressure step comprises the steps of:

- receiving a tip temperature " $T_t$ " from a temperature sensor;
- processing a control algorithm;
- calculating an adjustment to said first pressure; and
- controlling said first pressure.